**IB MYP YEAR 5**

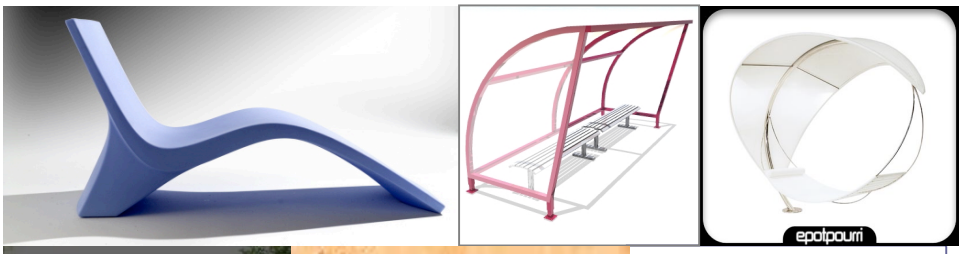
## ASSESSMENT TASK

# The water front bench

| | | | |
|---|---|---|---|
| **Subject:** | Y10 Standard Mathematics | **Name (Class):** | (  ) |
| **Topic:** | Polynomials | **Reading material:** | Chapter 2 & 6 in Book A |
| **Date of task assigned:** | 22nd September, 2011 | **Due Date:** | 6th October, 2011 |
| **Submission of task:** | Please submit a print copy of the assessment to your Maths teacher on or before Thursday, 6th October 2011 at 0840. | | |

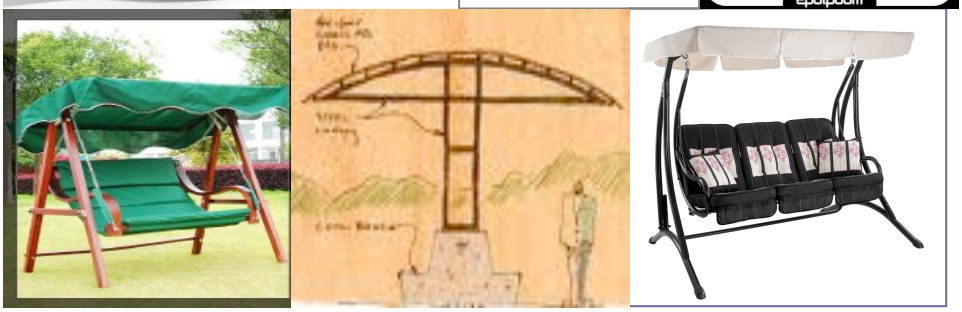
## This task assesses Criteria A, C, & D.

**Task Brief:** Design a water front bench with a canopy.




Canopy ->

Seat->



**ADVICE:**

Read the criteria descriptors and task-specific rubrics carefully before you start your work. This will give you a clear understanding of what is required and what a high quality piece of work for this task must include.

This way you give yourself the best chance of achieving the highest levels in this task.

## Please attach this sheet to your final report.

## The Task

### Background

You have been hired as a new designer at the *Polynomial Seating Company (PSC)*. The company is world famous for designing and manufacturing creative and attractive seats and benches, mainly for outdoor use. The Manager is giving you a special task for a new client.

**You are given the task of designing a chair/bench for use outdoors. The client wants your designs quite quickly. So does the manufacturing department of PSC, as they will want to start production quite soon.**

The bench should be (a) comfortable, (b) suitable for keeping off the sun and the rain and (c) have a profile that is highly mathematical in shape – in fact it should use functions that you have met in this topic of Polynomials (i.e. quadratics).

Of course, you won't ***build*** the bench, but you will come up with the functions (equations) that will define the shape of the bench.

You will submit a report that outlines the development of your design. The report will be assessed using MYP Assessment Criteria A, C and D, and the paragraphs below expand on this.

### Criterion A:

Here you show your ***knowledge and understanding*** of quadratic equations and their graphs. You MUST provide all the appropriate information about your design specification including:

- Accurate plots of all graphs, showing the important features of the design;
- Sets of equations describing all curves used and listing the range of x-values;
- The process (mathematics) by which you came up with the equations used in the design including possible modifications that could be made if requested by the client.

In order to score top marks in this criterion, you should show how you have used your knowledge in ***unfamiliar situations*** by embedding and developing at least one function that has not been covered in class, such as a cubic.

### Criterion C:

Your design needs to be ***communicated*** effectively for your manager, the client, and the manufacturing department who will use it to make the actual bench. This means that all graphs will be clearly labeled, and all appropriate diagrams and charts will be explained. Equations will have to connect sensibly to appropriate units of distance.
Any software used will have to be cited and, if necessary, explained.

### Criterion D:

***Before*** you begin your design, it is important that you come up with a set of specifications so the client can see how comfortable, sheltered, and creative your design will be. You need to ***reflect*** (and possibly research) on associated real-life issues, such as:

- People's sizes and comfort levels;
- How people sit or lounge;
- How the sun and the rain act;
- How easily the bench might be stored away;
- Any other features that you believe may be relevant to the product.

Once you have finished your design, please ***evaluate*** it against the specifications you listed before you began. Consider how well your model fits your specifications by checking the degree of accuracy (possibly percentage error or sig. fig.). Because the client wants the initial design in just a few days, there may well be a number of things you cannot do. If you had more time, suggest what other things you might do to improve your product? What different mathematical methods might you have tried?

# Assessment Criteria for Y10 Standard Maths Bench Assessment

**Criterion A**

| Levels | Task-Specific Rubric | Official IB Descriptors |
|---|---|---|
| **0** | The student does not reach a standard described by any of the descriptors given below. | |
| **1-2** | The student generally makes appropriate selections of one or more simple functions (such as y=mx+b, $y = x^2$) and manipulates them in to form a chair/bench. | The student **generally** makes appropriate deductions when solving **simple** problems in **familiar** contexts. |
| **3-4** | The student generally makes appropriate selections of two or more non-linear functions (eg quadratics) and manipulates them to form a chair/bench. | The student generally makes appropriate deductions when solving **more complex** problems in **familiar** contexts. |
| **5-6** | The student generally makes appropriate and accurate selections of three or more functions (eg a mixture of linear and quadratic) and manipulates them to form a chair/bench with a canopy. | The student **generally** makes appropriate deductions when solving **challenging** problems in a **variety** of **familiar** contexts. |
| **7-8** | The student consistently makes appropriate and accurate selections of four or more functions, at least one of which is an unfamiliar one (eg cubics, exponential etc) to form a chair/bench with a canopy. | The student **consistently** makes appropriate deductions when solving **challenging** problems in a **variety** of contexts including **unfamiliar situations**. |

**Criterion C**

| Levels | Task-Specific Rubric | Official IB Descriptors |
|---|---|---|
| **0** | The student does not reach a standard described by any of the descriptors given below. | |
| **1-2** | Some very basic equations are offered and described. There are some appropriate diagrams and graphs. There is a basic narrative that describes the processes used. | The student shows **basic use** of mathematical language and/or forms of mathematical representation. The lines of reasoning are **difficult to follow.** |
| **3-4** | Equations used are generally clearly explained. Clear, accurate and relevant graphs, and/or charts and tables are provided. It is generally easy to see how these diagrams describe the development of the chair/bench design. Key vocabulary is used. Narrative is generally accurate. | The student shows **sufficient use** of mathematical language and forms of mathematical representation. The lines of reasoning are **clear though not always logical or complete**. The student moves between different forms of representation with **some success**. |
| **5-6** | Several graphs and diagrams are offered to show the development of the chair/bench. Graphs are accurate and detailed. Equations are provided which match the important features of the graphs. It would be possible for PSC engineers to produce the chair/bench from the diagrams. The narrative is very clear. | The student shows **good** use of mathematical language **and** forms of mathematical representation. The lines of reasoning are **concise, logical** and **complete**. The student moves **effectively** between different forms of representation. |

**Criterion D**

| Levels | Task-Specific Rubric | Official IB Descriptors |
|---|---|---|
| **0** | The student does not reach a standard described by any of the descriptors given below. | |
| **1-2** | There has been a limited amount of relevant research undertaken. To some degree, the student has connected this research to the design of the chair/bench. | The student **attempts** to explain whether his/her results make sense in the context of the problem. The student **attempts to describe** the importance of his or her findings in connection to real life where appropriate. |
| **3-4** | The student has undertaken good, relevant research and has used this in the development of the chair/bench. The student has explained with justification how the design features of the chair/bench relate to real-life issues. The student tries to explain the accuracy of the equations. | The student **correctly but briefly explains** whether his/her results make sense in the context of the problem. The student **describes the importance of** his/her findings in connection to real life where appropriate. The student **attempts to justify** the degree of accuracy of his/her results where appropriate. |
| **5-6** | The student critically compares the final product with features identified at the design stage. Real-life issues associated with the design are developed. The student justifies appropriateness and accuracy of all equations and offers a critical review of the mathematical methods used, suggesting viable alternatives or improvements where appropriate. | The student **critically explains** whether his or her results make sense in the context of the problem. The student provides a **detailed explanation** of the importance of his/her findings in connection to real life where appropriate. The student **justifies** the degree of accuracy of his/her results where appropriate. The student suggests improvements to his/her method when necessary. |